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ABSTRACT

This report describes how the National Network of Eisenhower Regional Consortia and the Eisenhower National Clearinghouse are accomplishing their stated objectives. The report is organized into sections beginning with information about how to access the network. The topics of the remaining sections include: (1) Collaboration and Communication; (2) Programs and Curricula; (3) Professional Development; (4) Curriculum Frameworks; (5) Technology; (6) Equity; (7) Informal Education Entities; and (8) Community Outreach. In addition, graphic figures are presented to illustrate overall characteristics of the services provided. Each section uses activities in a variety of geographic regions to highlight the services that are provided through the Consortia and Clearinghouse. The activities show that staff members are often the catalysts that bring together teachers and state-level policy makers, community members and teacher trainers, museum directors and school people, and school board members and administrators. (DDR)

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THE NATIONAL NETWORK OF
EISENHOWER REGIONAL CONSORTIA
AND NATIONAL CLEARINGHOUSE

ED 403 159

Mathematics & Science Education

1997 REPORT

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The National Network of Eisenhower Regional Consortia and National Clearinghouse is pleased to present this report on recent activities and impacts.

The Consortia and Clearinghouse have been funded by the U.S. Department of Education since 1992 to support improvement in mathematics and science education throughout the nation. There are ten Consortia, one in each U.S. Department of Education Regional Educational Laboratory region, plus the Eisenhower National Clearinghouse located at Ohio State University. The Consortia and Clearinghouse actively collaborate as a national network to share resources and make them available to schools throughout the country. The Consortia have three objectives:

- To identify and disseminate exemplary mathematics and science education instructional materials.
- To provide technical assistance in implementing teaching methods and assessment tools for elementary and secondary school students, teachers, and administrators.
- To collaborate with other organizations engaged in mathematics and science education improvement.

The Eisenhower National Clearinghouse (ENC) has a special role:

- To collect and describe K-12 mathematics and science education materials including print, audio, video, multimedia, kits, and Internet sites.
- To disseminate information about the collection through ENC Online (available via Internet or a toll-free dial-in number), CD-ROMs, and print materials.
- To collaborate with the Regional Consortia to create demonstration sites throughout the nation.

This report uses selected activities to describe how the Regional Consortia and National Clearinghouse are accomplishing these objectives. It begins with information on how to access the network, followed by sections on each of eight focus areas listed below. In addition, graphic figures are presented to illustrate overall characteristics of the services provided. The Consortia have designed and implemented a cross-Consortium data system which captures information nationally on client services beginning in October 1995. The data in the figures represent nine months of activities — through June 1996.

FOCUS AREAS

The legislation that created the Consortia specified 13 areas of possible focus. Across the Consortia, there are activities in each area, but the eight below capture the primary services provided.

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HOW TO CONNECT

Write, telephone, telefax, or e-mail the Consortium in your region (see map on back cover) or the National Clearinghouse using the information in the directory which follows.

To connect to ENC, call toll-free with a modem and computer: (800) 362-4448; or with Internet access via the World Wide Web (<http://www.enc.org>); or telnet (enc.org) and login as guest). For more information call (800) 621-5785 or e-mail info@enc.org.

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The Eisenhower Consortia and Clearinghouse work cooperatively with other mathematics and science education organizations at the local, state, regional, and national levels.

COLLABORATION AND COMMUNICATION: Weaving a Web of Support for Mathematics and Science Education Nationwide

One impetus for the legislation establishing the Eisenhower Regional Consortia and Clearinghouse was the need for coordination among the many people and institutions working to improve students' mathematics and science learning. Congress wanted to capitalize on the gains made in one community, state, or region by providing a supportive infrastructure to promote sharing and communication across the science and mathematics communities. By establishing a network of a national clearinghouse and ten regional entities, Congress laid the underpinnings for the widespread collaboration and communication we find today.

When each Consortium first looked at its region, it saw an array of educational opportunities, many of whose providers were unaware of the others. Today, the Consortia see even more opportunities, but now those who help teachers improve their science and mathematics instruction not only know about each other, they communicate, coordinate, and collaborate to reach more teachers and students than ever before.

Pennsylvania, for example, has neither a National Science Foundation (NSF) Statewide Systemic Initiative nor an OERI Curriculum Frameworks grant. The Mid-Atlantic Eisenhower Consortium at RBS (Research for Better Schools) has enabled Pennsylvania's mathematics and science educators to mount a systemic effort to improve mathematics and science education statewide. The effort began when the Consortium invited 125 educators from across the state to form a coalition called the Pennsylvania Team. The team planned how to make mathematics and science reform a statewide public priority and how to assist their fellow educators in acquiring the knowledge and skills to make it happen. Supported by the Consortium, they used conferences, electronic communications, and professional development seminars to reach the state's teachers. By their third year, the excitement generated by the Pennsylvania Team extended beyond mathematics and science professionals. As third-year chair Tom Jones stated, the guidance from the Consortium "provided a foundation upon which to build. We are beginning to look beyond the individual classrooms and schools to the people in the community."

But each Consortium addresses regional — not just state — needs, and each brings representatives from all their states to a regional table to coordinate services across the region or to work together to address common problems. Wimberly Royster of the Kentucky Science and Technology Council, Inc., found the regional board of the Appalachia Eisenhower Consortium at AEL (Appalachia Educational Laboratory) a helpful source of advice and support when he was exploring the feasibility of obtaining a grant to improve science and mathematics education for geographically isolated students in the central Appalachian region. In 1995, the Council was successful in obtaining a \$10-million, five-year award from NSF to improve student achievement in 66 rural counties in six states by integrating technology into the curriculum. Royster, Principal Investigator of this Appalachian Rural Systemic Initiative, credits the Appalachia Eisenhower Consortium with supporting the effort from the beginning. "Consortium staff provided information and leadership during the grant writing, and they continue to serve as one of our major advisors," he says. In addition, a Consortium staff member serves as director of the initiative's community engagement efforts.

Together, the ten Consortia and Clearinghouse provide a ready-made infrastructure that can scale up and speed up the spread of successful practices across regions. For example, in

1993, the Miami Museum of Science was awarded a grant from NSF to nationally disseminate a program it had developed. Called InTech (Integrating Technology into Elementary Mathematics and Science Curriculum), the program had shown itself effective in helping teachers use technology as a tool in advancing mathematics and science learning. The goal of the NSF grant was to develop a national cadre of specialists prepared to help teachers learn how to use technology resources like simulation software, CD-ROMs, videodiscs, probeware, telecommunications, and databases to help students achieve in mathematics and science. With leadership from SERVE's (SouthEastern Regional Vision for Education) Southeast Eisenhower Consortium, six of the Consortia assembled teams of educators in 25 states to receive training so that they could effectively train others.

In 1994, 150 educators from these six regions attended a four-day intensive InTech Institute to learn how to deliver the InTech model to teachers in their districts and states. These trainers — primarily district and state staff and technology specialists — credited InTech with giving them insight into "how computers can be fully integrated and used to deliver the curriculum." And the follow-up support available from the Miami Museum of Science and each trainer's Eisenhower Consortium has been "invaluable," they say, in helping them train more than 4,500 teachers across the six regions to use the "best model of how to integrate technology into the curriculum" that most of them "have ever seen." In the Southeast region alone, 1,100 educators have already learned to use this model.

And the Eisenhower National Clearinghouse serves as central repository and source of information for educators across the country. Any teacher or trainer logging on to the ENC Home Page on the World Wide Web or calling its toll-free number can find thousands of resources in the ENC database including effective lesson plans, journal articles, the national science and mathematics standards, professional development opportunities, and state science and mathematics curriculum frameworks.

Number of Collaborators by Type

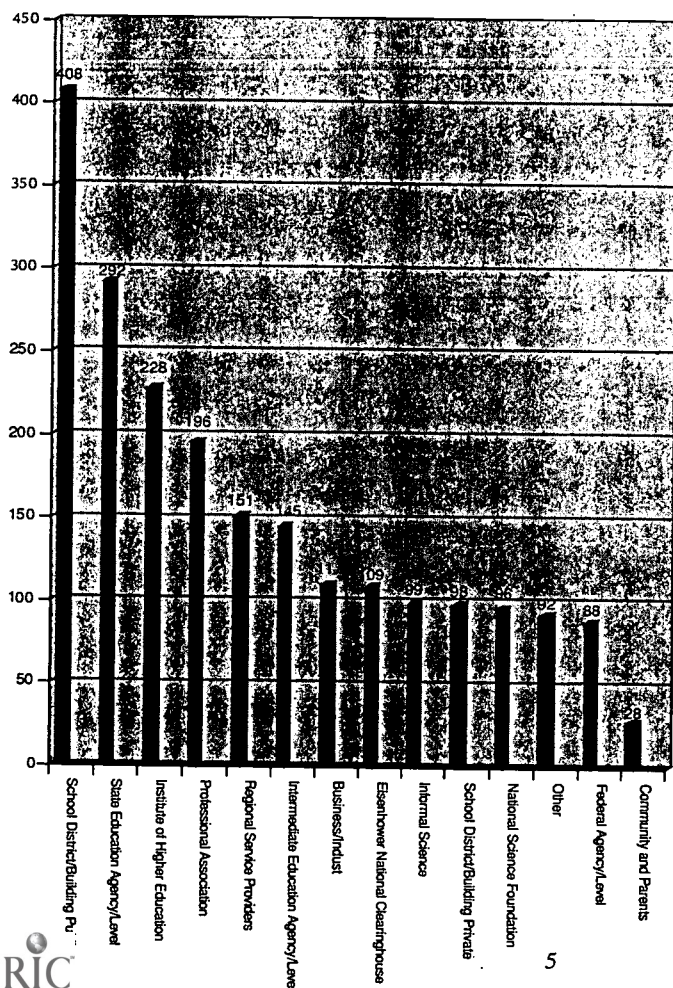


Figure 1.

The Consortia collaborate with a variety of organizations; over 2,000 were named in activities from October 1995 through June 1996. Almost 20% were public schools, 14% state education agencies, and 11% colleges and universities.



The Eisenhower Consortia identify and disseminate exemplary mathematics and science materials, methods, and assessments with and through the Eisenhower National Clearinghouse.

PROGRAMS AND CURRICULA:

Becoming "First in the World in Mathematics and Science by the Year 2000"

The fifth National Education Goal is for our students to be first in the world in mathematics and science by the year 2000. What is unclear is how we will know when we get there. What will our students need to know and be able to do — by what age and at what level of proficiency? Or put another way, by what standards will we know whether our students are first in the world?

The much-anticipated Third International Mathematics and Science Survey (TIMSS) is based on a set of standards agreed upon by a panel of educators representing the various countries participating in the survey. The content covers mathematics, science, and technology as well as information about teaching methods, materials, and technology use. But since assessments like TIMSS are meant to make broad international comparisons rather than provide local school data, how can local schools and districts use the results of such international surveys to examine and improve their local curricula, teaching practices, and instructional materials?

A group of 20 suburban Chicago superintendents kept asking that question of the U.S. Secretary of Education. Eventually, working with support from the Secretary's office, the White House, Chicago-area legislators, and the Midwest Eisenhower Consortium at NCREL (North Central Regional Educational Laboratory), these superintendents have voluntarily put their students — and the instruction and curricula that prepare them — up against students in the rest of the U.S. and the world. According to David Kroeze, one of the district superintendents, "If we want our students to be best in the world, we need to start by comparing their performance to the performance of the best in the world. Next, and more significantly, we want to use the results to improve our curriculum, instruction, and professional development."

So last spring, approximately 3,000 students in grades 4, 8, and 12 of the 20 districts completed the TIMSS assessment. For purposes of the international comparison, these 20 districts will be treated as a country (but not included in general reports). As Paul Kimmelman, another district superintendent, points out, "In the 30-year history of TIMSS, our districts are the only local benchmark in the world."

With assistance from the Consortium, the districts have established multi-district learning networks of teachers and administrators to study and learn how to improve learning opportunities for students in their schools. The four primary areas of this professional development effort are curriculum and instruction, assessment practices, learning theory, and use of technology. Based on the TIMSS results, the districts will identify content areas where their students do well and not so well. For the latter, they'll examine classroom practices: "Are we giving sufficient attention to that content? Are there more effective approaches for teaching the content?"

Because of the efforts of the Midwest Eisenhower Consortium, these districts are committed to making their results and their process available to other districts across the country. "It is important that children around the nation have the opportunity to ratchet up their learning and achieve excellence," say the superintendents.

But even beyond TIMSS, American schools are turning to their Eisenhower Consortium for assistance in improving mathematics and science education. The Pacific Consortium at PREL (Pacific Region Educational Laboratory), for example, is working with educators across Hawaii and the Pacific Islands to develop a deeper understanding of science and mathematics reform, to align their frameworks and curriculum guides with larger initiatives, and to strengthen curricula to meet the demands of world-class standards.

In Yap, an effort to align the curriculum formed the basis for developing an addendum to the Yap Science Series. This addendum will provide a more comprehensive science education to elementary students in Yap, while continuing to give attention to the cultures, environments, and experiences encountered by Yapese children. Through its collaborative agreement with the Curriculum Research and Development Group (CRDG) at the University of Hawaii, the Consortium was able to assemble a task force made up of Yapese educators, Consortium staff, and CRDG personnel to adapt exemplary materials developed at the University of Hawaii for use in the Yapese educational context. The activities that resulted are developmentally sound, reflect standards-based content and practices, are relevant to Yapese children, and honor and value the Yapese culture.

The materials they adapted are the Foundational Approaches in Science Teaching (FAST) and Developing Approaches in Science and Health (DASH), both of which have been nationally validated by the National Diffusion Network. Both are also featured in the 1994 edition of **Promising Practices in Mathematics and Science**, one of several efforts by the Consortia and Clearinghouse to capture and share information nationwide about exemplary programs and materials. **Promising Practices** volumes were compiled in 1994 and 1995 and published by the Consortia and Clearinghouse and widely distributed by each Consortium throughout the region it serves. All program descriptions are also available online on the Clearinghouse's Home Page on the World Wide Web and on ENC's CD-ROMs.

Number of Clients by Type of Customized Service

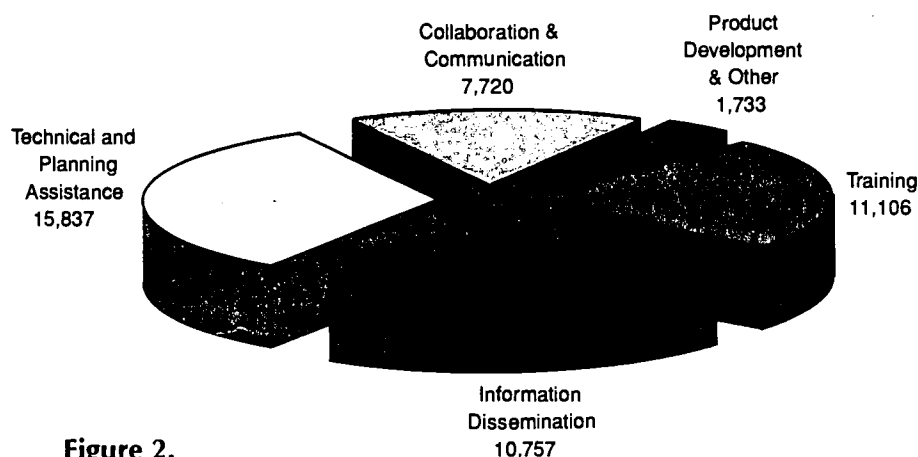


Figure 2.

The Consortia provide customized services for individual educators and groups, as well as broader scale dissemination services. Of the 47,153 clients of customized services from October 1995 through June 1996, 36% received technical and planning assistance, 24% training, 23% information, 16% collaboration and network building, and 4% product development.

The Eisenhower Consortia provide training for teachers, administrators, and trainers in the use of exemplary mathematics and science materials, methods, and assessments. And the National Clearinghouse supports Consortia efforts by collecting and making available the full text of a wide range of professional development materials online and on CD-ROMs.

PROFESSIONAL DEVELOPMENT:

Developing the Professional Skills of Today's Mathematics and Science Teachers

The teachers and students of the Lopez Riggins Elementary School in the lower Rio Grande Valley have a science laboratory right outside their door — the beaches, mud flats, and marshes of South Padre Island. Yet until 1994, the island's educational potential lay untapped. Like most elementary school teachers, those at Lopez Riggins had received little or no science training and were unfamiliar with teaching science by engaging students in exploration and discovery. To many of them, science was "memorizing facts."

But no more, thanks to a long-term professional development effort conducted by the Marine Education Services center of the University of Texas at Port Aransas, supported by the Southwest Eisenhower Consortium at SEDL (Southwest Educational Development Laboratory). Today, according to Rick Tinnin, Marine Education Services Director at the center, Lopez Riggins teachers have "made a quantum leap in content knowledge." More importantly, more students are reaching the district's benchmarks in reading, mathematics, and language arts.

When Tinnin applied to the Southwest Consortium for support, he deliberately chose a long-term project working with the same group of teachers over time. He knew that a substantial body of research suggests that in order to produce real change in classroom teaching, professional development must be sustained and include classroom application and follow-up. In fact, Tinnin reports, "it took 13-14 months to turn the teachers around" — to develop their instructional approach from teaching science as facts to using an exploratory process of engaging students. It wasn't until that corner was turned that teachers began to incorporate their new content knowledge and teaching strategies into highly effective classroom instruction.

Tinnin's involvement with the Southwest Consortium began when he competed for one of 15 awards granted to local schools and districts by the Consortium to provide intensive and long-term teacher professional development. Each award supports an effort that adheres to a set of research-established professional development criteria. Each site has a project director, who, like Tinnin, designs professional development activities that meet the needs of that school community. Some project directors are teachers themselves; others are district administrators or coordinators, or professors from a partner school or university.

Teams from all 15 projects also attend a Consortium-sponsored week-long institute each year. At this session, Consortium staff model exemplary practices for participants, who return to their local projects with new ideas for improving mathematics and science in their schools, as well as the skills to help others implement them. In the program's first year, for example, Consortium staff used a local geologic structure, the Edward's Aquifer, as the focal point for a series of events that modeled hands-on science, integration of mathematics and science, cooperative learning, and alternative assessment.

All Eisenhower Consortia provide a rich variety of professional development support to teachers. They extend their impact through electronic networks, training trainers, and brokering the professional development offerings of others. For example, the Northwest Consortium at the Columbia Education Center offers financial support to teams of teachers wishing to attend one of the many summer course offerings in the Northwest, e.g., environmental studies or technology applications

for science and mathematics classrooms. The Consortium's support may open up one state's institutes to teachers from other states. Each dollar of Northwest Consortium support is accompanied by at least two other dollars in support from partners.

Such courses can be "pure gold" to teachers hungry for new scientific and mathematical knowledge. At least that's how one teacher from the Mid-Atlantic region assessed the week-long summer symposiums on Fractals, Chaos, and Dynamics held at the Princeton Plasma Physics Laboratory for two years. The presenters included internationally acclaimed mathematics researchers.

The Mid-Atlantic Consortium provided scholarship support for teachers who could not otherwise attend. These scholarships were a key factor in enabling a wide and diverse audience of teachers, particularly those who teach students in schools traditionally underserved, to receive training in the most up-to-date and exemplary science and mathematics methods.

Teachers, who came to this symposium because they wanted to "stretch themselves," were not disappointed as they were challenged with hands-on activities, graphing calculator experiments, and computer explorations designed to give them firsthand working knowledge of cutting-edge topics. Teachers reported doing a mental search of their curriculum and finding opportunities to plug everything into their classroom work. One participant reported later, "When I teach this to my low-ability high school groups, the students become very interested. They see the sequences and patterns and become engaged in learning."

According to a third-party evaluation of the symposium, it improved the qualifications and classroom effectiveness of those attending; they are now qualified to teach the "new" disciplines of chaos theory and fractal geometry.

Percent of Activities by Activity Length

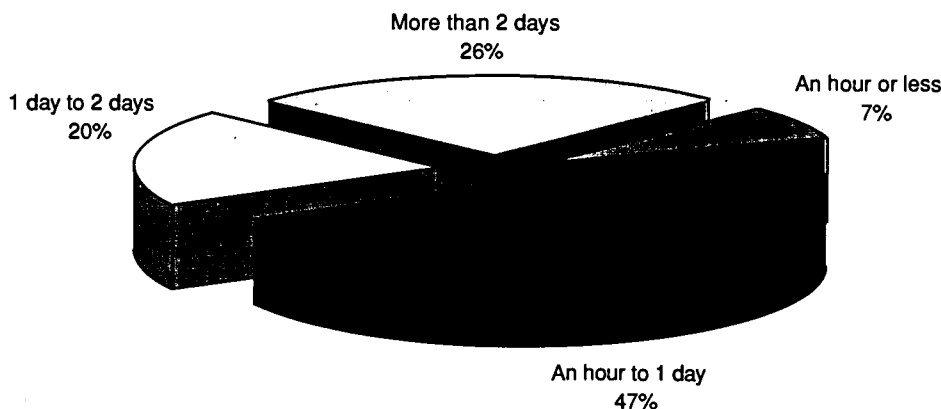


Figure 3.

The Consortia provide both short-term and long-term services. Services requiring an hour to a day accounted for 47% of the 823 time-relevant Consortium activities in the October 1995 through June 1996 period. Another 46% were multiple-day activities.



4

CURRICULUM FRAMEWORKS

The Eisenhower Consortia and Clearinghouse assist states in developing and implementing curriculum frameworks, performance standards, and assessments that hold promise for systemic reform in mathematics and science education.

CURRICULUM FRAMEWORKS:

Improving and Aligning State Curriculum and Assessment

By the early 1990s, Utah educators and policymakers had become frustrated with the state's core science curriculum. Developed in 1985, the state framework was outdated. It outlined what science topics students were supposed to learn about and at what grade level. However, the framework focused almost exclusively on the "what" of science; for example, it asked students to name and label the parts of a cell. But the framework was silent about the "how" or "why" of science; it didn't ask that students understand how cells work or why cells are the basis of life.

Many elementary teachers in the state had never taken college-level science courses because they had become certified before such courses were required. They were unaware of what was missing in the core curriculum and unlikely to provide it. As a result, many elementary students experienced science as a mass of disconnected facts. Those teachers who went beyond the limited list of topics provided by the state and offered a curriculum that enabled students to connect the facts — to grasp underlying concepts and processes of science — were constrained by the statewide science assessment that tested only for recall of isolated facts.

The state decided to develop new science performance assessments, which would also require development of the next generation of the state core curriculum. Once they began, the Utah State Office of Education called on their Eisenhower Consortium for assistance. The WestEd Consortium worked with Chief State School Officer Scott Bean, the state's Science Education Specialist Brett Moulding, and a very broad base of Utah educators to revise the Elementary and Secondary Science Core Curriculum. A 40-member Utah Science Coordinating Committee convened hearings in every region of the state to gather input on the core curriculum itself, the kinds of changes that needed to be made to the existing curriculum, and the process the state would use to make those changes.

According to Dr. Phyllis Embley, Curriculum Consultant and Science Coordinator for the Jordan School District and a member of the committee, "All data from the hearings were fed to a team of teachers from throughout the state to draft the new curriculum." Ably assisted by staff of the Eisenhower Consortium, the team undertook a process of review and feedback that included a pilot test in several districts. The teachers who piloted the curriculum also helped finalize the document that went to the State Board for action.

The Utah State Board of Education adopted the results of their effort as the new Elementary and Secondary Science Core Curriculum. This new state framework "is magnificent," says Tom Davidson, who was a member of the Board at the time. "It ties together science learning by having children do things that they can relate to." Teachers frustrated by the old core curriculum's limitations are now better able to support their instruction with effective assessment procedures that are in line with the state framework. And because teachers were part of the process, they are better able to use them to improve instruction for the half million students in Utah.

In fact, according to Embley, "All groups — the Utah State Office of Education, the teachers, and the districts — feel that they own the curriculum." Because everyone was included in the process from the beginning, the curriculum "passed the Board with flying colors," says Davidson. "Everyone loved it. Since 1994," he claims, "all curriculum revisions have gone through a similar series of hearings and pilot tests."

Throughout the process, the Utah educators were assisted by the WestEd Consortium, whose staff helped plan and conduct the hearings and provided background materials to participants as needed. They brought in standards and benchmarks documents as they were released. This provided a national perspective based, in part, on their membership in the network of Eisenhower Consortia. Embley praises their ability to "work with and understand the classroom and teaching at the same time that they understand national goals and perspectives. They have the knowledge and skills to facilitate the process," she adds.

Utah's reliance on its Eisenhower Consortium for this knowledge and skills provides but one example of how states and local communities across the country are drawing on the Consortia for assistance with curriculum frameworks. Six of the Consortia have worked with 31 states and jurisdictions that are revising their state frameworks — bringing state personnel together within and across various regions of the country to learn from each other and share ideas and knowledge, and helping them with the revision process. These Consortia also conducted case studies of local sites that are implementing their state frameworks — translating the state policy into real classroom practices, procedures, and instruction. The case studies provide written examples to help state policymakers understand the results of their policy formulations. They also help inform other districts that are working to develop local frameworks and implementation guides in line with their state frameworks.

In addition, the Eisenhower National Clearinghouse has invited all states to send their frameworks to the ENC to include in its collection of state curriculum frameworks. The frameworks are available online as well as on CD-ROM. A unique collection of the National Council of Teachers of Mathematics (NCTM) Curriculum and Evaluation Standards, curriculum frameworks from 12 states, and professional journal articles that discuss and illustrate the implementation of the standards also is available on an ENC-issued CD-ROM.

Number of Clients by Type of Organization

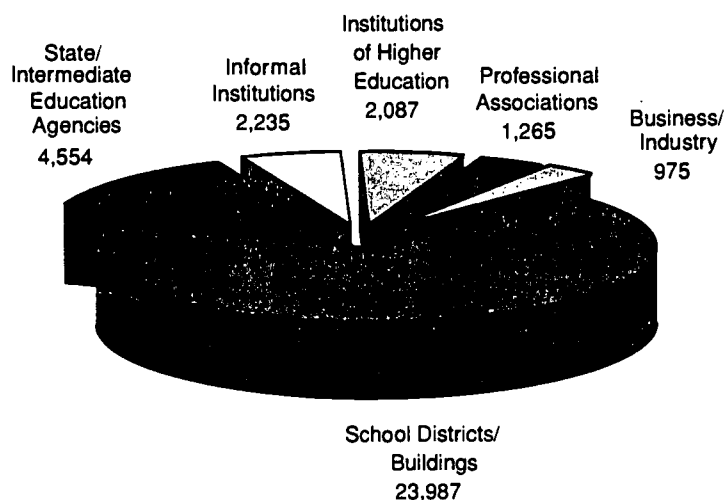


Figure 4.

The Consortia serve clients from many sectors of the formal and informal education system. Of the 35,103 clients of customized services from October 1995 through June 1996 who could be identified as representing primary client groups, the majority (68%) were practitioners in schools.

The Eisenhower Consortia and Clearinghouse facilitate the use of telecommunications technology as a tool for instruction and professional development in mathematics and science education.

TECHNOLOGY:

Harnessing the Power of Technology to Advance Teaching and Learning

"The first year I participated in the Kids as Global Scientists project (an international network of teachers and students studying weather), I was intimidated by computers and could barely read my own email. It's now my third year and things are very different. I'm more comfortable with the technology and have learned how to use it with students. I've also developed a flexible, more responsive teaching style. My experiences with kids and the Internet have shaped my thinking in ways I didn't anticipate." Such is the power of technology as reported by sixth-grade teacher Kristine Mueh in a collection of **Tales from the Electronic Frontier**.*

In addition to the richness (and potential confusion) of the Internet, educators are barraged by publishers of educational technology, who are rushing into a booming industry where annual sales outstrip those of textbooks by more than tenfold. But how can teachers find out about, learn to use, and evaluate the effectiveness of the technology options increasingly available to them? One answer is the National Network of Eisenhower Regional Consortia and National Clearinghouse. Through demonstration sites, various online services, and publications, the Clearinghouse and Consortia are helping educators and communities understand, assess, and use new technologies to further their own education and enhance classroom instruction.

A network sponsored by the Northeast & Islands Consortium at TERC includes a group of 35 schools that are partnering with the Consortium, each other, and state-reform partners to make more resources available to improve their mathematics, science, and technology programs. Many of these schools are located in small, isolated communities, often in northern New England, and currently have little access to technology. Their students, many of whose family incomes fall below the poverty line, are unlikely to have computers at home or be familiar with computer technology. As a result of their membership in the Consortium network, the 14 teachers at a school in Maine that serves a primarily Native American population have arranged with a local Internet provider to give their school free access during school hours, and the teachers reduced rates at home. This will enable the school and its students for the first time to draw on the resources of the Internet to support instruction and the teachers to communicate with and learn from the other partners in the Consortium network.

From 1993-1995, the Appalachia Eisenhower Consortium was the frequent host for guests curious about how to use technology in the classroom. These guests clustered in the ENC Technology Demonstration Site to view and work with state-of-the-art software programs in mathematics and science education. The demo site, located in an old office building in the heart of downtown Charleston (WV), is one of 12 set up around the country by the ENC. Visitors, generally teachers and administrators, learn about the hardware from knowledgeable staff and sample instructional software to assess its suitability and effectiveness. They also learn how to locate resources on the Internet.

Although the Appalachia demonstration site hosted over 700 visitors in its first three years, it was difficult to bring in preservice teachers, or even teachers from remote, rural areas. So, the Consortium staff decided to move it to different sites in the region to spread its benefits. In the

* Shinohara, M., Wenn, R., & Sussman, A. (Eds.). (1996). *Tales from the Electronic Frontier: First-Hand Experiences of Teachers and Students Using the Internet in K-12 Math and Science*. San Francisco: WestEd.

fall of 1995, the Consortium moved the Technology Demonstration Site to the University of Tennessee-Martin Center for Excellence in Science and Mathematics Education and trained faculty to demonstrate the equipment, materials, and programs. Already more than 600 pre-service and inservice teachers in Tennessee have been served. These results are being replicated all over the country, as each Consortium draws educators to its own Technology Demonstration Site.

The Midwest Consortium has located its Technology Demonstration Site at the Department of Energy-supported Fermi National Accelerator Laboratory, while the Northwest Consortium is working with several partners, including the University of Montana in Missoula, the University of Idaho in Moscow, and Pacific University in Forest Grove (OR), so they can become access centers for technology.

In addition to the thousands of educators who have visited a Technology Demonstration Site, over 3,000,000 connections have been made to what upstate New York teacher Emmett Hoops calls his "constant online coach." ENC Online offers the Clearinghouse's vast storehouse of information on all aspects of mathematics, science, and technology education to educators 24 hours a day. It is available through the Internet or a toll-free dial-in service.

ENC Online also provides teachers with a means to sift through and find the best and most useful Internet sites. For example, ENC picks 13 mathematics and science sites each month to feature in its "Digital Dozen." ENC staff archive the sites and regularly revisit them to be sure the links are up to date. Mathematics and science teachers can feel certain when they visit ENC Online that they are getting the best the Internet has to offer.

The ENC and all the Consortia are linked to each other. Each is a point of access to the Internet and provides information through World Wide Web as well as Gopher servers. Some, like the Northeast Consortium, have established professional networks of teachers, state agency officials, college and university faculty, and museum and science center educators and linked them electronically via listservs. The Consortium provides email accounts to those without them and offers training for schools to establish their own Web pages.

But not every teacher has access to the Internet, and so the Consortia and the Clearinghouse provide materials in more traditional forms — books, manuals, diskettes, and CD-ROMs. The High Plains Consortium at McREL (Mid-continent Regional Educational Laboratory), for example, published a case history of a Nebraska middle school that had acquired a critical mass of computer technology and Internet connectivity. This computer magnet school had learned so much from its experience that it wanted to capture and share its learnings with other schools.

Number of Clients of Dissemination Services

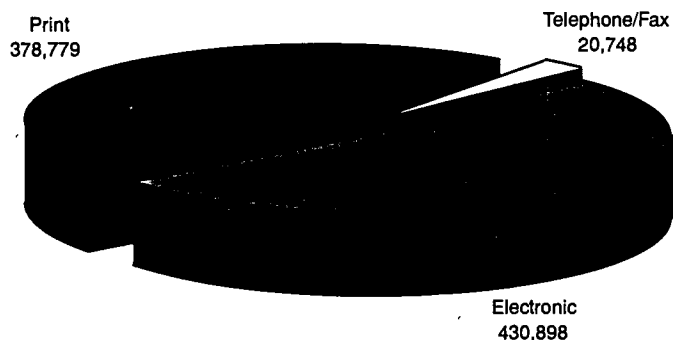


Figure 5.

The Consortia disseminate resources on a very large scale — to 830,425 clients from October 1995 through June 1996. Electronic media, like the Internet, were a primary means of delivery. In addition, over the same time the Clearinghouse had over 3,000,000 accesses to its electronic sites.



The Consortia support programs and activities designed to meet the needs of groups who are underrepresented and underserved in mathematics and science education.

EQUITY:

Ensuring That All Students Get a Fair Chance to Succeed in Mathematics and Science

In 1995 in Providence, Rhode Island, "twice as many students passed college preparatory algebra than were even enrolled in that gatekeeper course just five years ago," according to Anthony Terceira, Administrator of Mathematics and Site Coordinator for Equity 2000. Today, all seventh and eighth graders in this 75% minority school system are enrolled in pre-algebra, more students are taking the PSAT and SAT, and more minority students are going on to post secondary education. Why? Because in 1990, Providence was one of five cities nationwide to pilot The College Board-developed Equity 2000 program.

College Board-sponsored research showed that students who successfully complete college preparatory algebra in the ninth grade and geometry in the tenth experience greater college and career success than those who do not. Further analysis of the data showed that minority and female students were far less likely to complete these gatekeeper courses than white male students. "Such was the case in Providence," says Terceira.

A central premise of Equity 2000 is that all students can learn at high levels if provided with appropriate support in an environment of high expectations. Thus, it asks that a district eliminate tracking and require that all students take algebra and geometry. It suggests several compatible approaches to help guidance counselors, teachers, students, parents, and others understand and support the changes necessary for success. It is through such changes that Providence has been able to achieve the results it has.

With results like those in Providence, the Eisenhower Consortia have been eager to include Equity 2000 in the assistance they offer to their regions.

For example, the Northeast & Islands Consortium's Regional Equity Network asked the Consortium staff to assist its members in finding and using proven approaches to ensure equity at the local level. As one element of its response, the Consortium sponsored a summer institute at which it offered training in three different proven equity approaches, including Equity 2000. Together with Consortium staff, the Equity Network steering committee is helping districts provide the professional development and encourage the parent involvement so necessary for student success.

Like many of the Consortia across the country, the Northeast & Islands Consortium has offered Family Math, Family Science, EQUALS, and other programs that schools can use to bring parents — especially parents of traditionally underserved students — into the school to become supportive of their children's mathematics and science learning and achievement.

The EQUALS program from the Lawrence Hall of Science at the University of California, Berkeley is a good example of the professional development opportunities provided for teachers. It has been brought to many regions of the country by the Eisenhower Consortia. EQUALS provides continuing education for teachers in methods and materials that help attract and retain females and underserved minority students to mathematics. It helps teachers and students understand the need for mathematics, the options for further study, and careers available through mathematics success. Focusing on a K-12 population, EQUALS offers teachers strategies to build students' confidence and success in mathematics.

Schools in the Regional Equity Network in the Northeast & Islands also will be collecting data about which students take what kinds of mathematics and science courses, what grades they earn, and other important student outcomes. Analysis of such data could indicate, for example, whether most students of a particular guidance counselor take college preparatory algebra and geometry and pass, while others don't; if more minority students track into noncollege preparation courses; or if girls shy away from mathematics and science classes. With such data in hand, schools will be able to see correlations between student and school characteristics and achievement, and report them to their communities. They can then build a plan to address any areas of inequity. Continuing to collect and refine such data will enable schools to monitor and report on progress.

Number of Clients of Customized Services by Focus Area

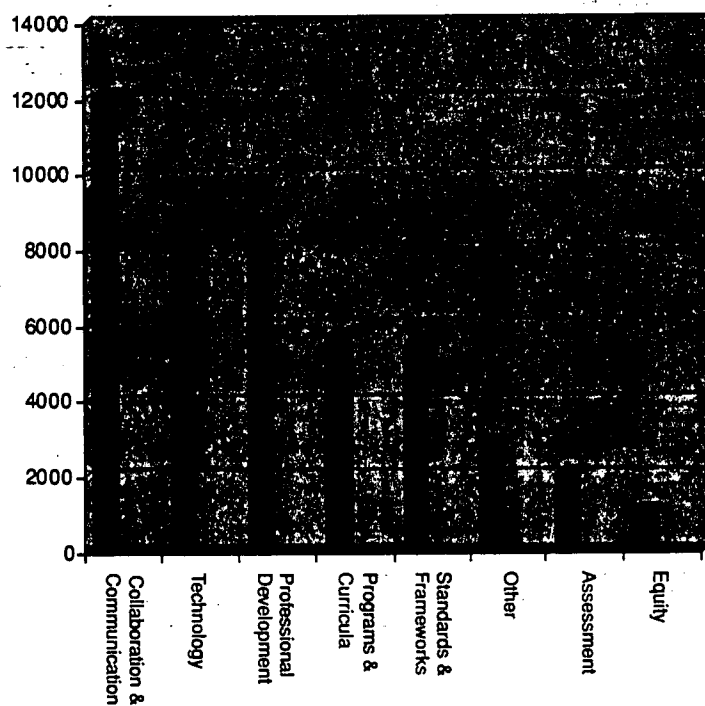


Figure 6.

Collaboration and communication (26%), technology (19%), or professional development (19%) were more often the focus of customized services delivered to clients than the other areas reported, based on the 47,153 clients of such services from October 1995 through June 1996.

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The Eisenhower National Clearinghouse and the Regional Consortia disseminate information about and support the use of informal mathematics and science resources such as science centers, museums, libraries, and 4H programs.

INFORMAL EDUCATION ENTITIES:

Strengthening Informal Science and Mathematics Education Opportunities

Some of the places where it is most fun to learn about science and mathematics — and to become motivated to study them — are in settings that are natural attractions for kids: zoos, parks, and aquariums or specialized sites such as the National Severe Storms Forecast Center in Kansas City, Columbia River salmon fisheries, and the Gettysburg National Military Park. Such settings are part of a vast informal education system that is helping the nation achieve its education goals related to mathematics and science. And the Eisenhower Consortia are helping to connect the components of this system with each other and with the more formal education system, thus strengthening both.

The High Plains Consortium, for example, is working with the informal education centers across the mid-continent region. Recently, the Consortium began identifying and cataloging educational programs available through informal education centers. The information is compiled in a directory featuring more than 50 programs. It is available on the Internet at <http://www.mcrel.org> and has been mailed in print form to all elementary school librarians. Now, educators and families throughout the seven-state region, as well as nationally, can easily find out about the offerings, services, costs, and hours of operation of specific sites.

In addition to finding information on children's museums and zoos, teachers using the directory will also find resources such as the University of Nebraska's State Museum. This museum offers a rich variety of science programs for teachers and students, including a NASA Regional Teacher Resource Center and science kits for classrooms. The Kansas Learning Center for Health offers lessons in anatomy and human development and disease for students of all ages. The National Bighorn Sheep Interpretive Center in Dubois, Wyoming provides students with insight into the relationship of the bighorn to its harsh natural environment; it also shows how successful wildlife and habitat management has enabled the bighorn to survive in that setting.

Teachers can also learn about the specialized education programs of national parks such as the Badlands in South Dakota or Yellowstone in Wyoming. And they'll even find out about another school district's planetarium and adventurarium, both of which are open to the public. What a great way to plan a vacation for the family — scheduling visits to informal education centers across the high plains!

In the Greater San Francisco Bay Area, informal and formal science education providers have formed an academy without walls for teachers and the 1.25 million students in a 12-county region. Sixty-nine organizations — science and technology centers, governmental agencies, county offices of education, universities and other providers of science professional development programs and resources to teachers — are members of the Science Education Academy of the Bay Area (SEABA). Funded by and housed at the WestEd Consortium, SEABA helps teachers access over 600 programs through its interactive electronic catalog and annual journal.

Building on its experience with SEABA, the WestEd Consortium is playing a major role in the Annenberg/CPB-funded national Informal Science Educators Network (ISEN), which links informal science educators around the country. In collaboration with the Association of Science-Technology Centers and the San Francisco Exploratorium, WestEd staff provide training and resources to help informal science educators use on-line tools to promote new ways of learning inside and outside of classrooms. All of the Consortia participate in this project by identifying participants in their region and helping them link with colleagues and schools locally and nationally.

Four of the Technology Demonstration Sites established collaboratively by the Clearinghouse and Consortia also are located in informal education sites: Lederman Science Education Center at Fermi National Laboratory, the Biodiversity Resource Center in Golden Gate Park in San Francisco, the Georgia Youth Science and Technology Center at Zoo Atlanta, and the Oregon Museum of Science and Industry.

Number of Clients of Dissemination Services by Focus Area

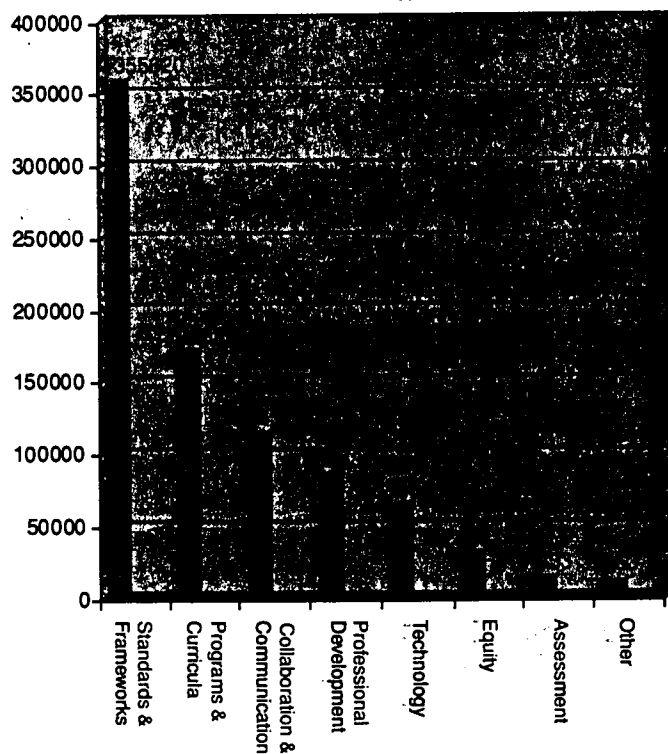


Figure 7.

Standards and frameworks was by far the most frequent focus of dissemination services delivered to clients (43%); programs and curricula (21%) and collaboration and communication (13%) were next — all based on the 830,425 clients of such services from October 1995 through June 1996.

The Consortia support communications to and engagement with community groups concerning systemic improvement in mathematics and science education.

COMMUNITY OUTREACH:

Reaching Out and Drawing In Parents and Community Members

As this report illustrates, the journey toward systemic reform in mathematics and science has begun. State and local leaders across the nation are recognizing the links between quality education and a foundation for prosperity. Legislators are mandating high standards for graduation; states are developing challenging curriculum frameworks; teachers are looking for better materials, methods of teaching, and assessments; and families and the general public are raising their expectations about education.

The Eisenhower Consortia have been active partners in this effort: identifying and sharing information and models of best practices; bringing people together; collaborating with others, creating and disseminating useful products; and assisting schools, districts, states, and others with varied tasks related to mathematics and science education reform.

Another major role for the Consortia has been sharing information about reform with the public. These efforts have involved partnering with others in concentrated general awareness campaigns, as well as more intensive interactions with parents.

Polls show that many Americans remember their mathematics and science classes as places where they failed to achieve. Parents may inadvertently convey their own lack of confidence to their children, and they may need information and other resources to encourage and facilitate their children's achievement in mathematics and science.

All Consortia are making a concerted effort to reach families, especially of underrepresented groups. The Lawrence Hall of Science at the University of California, Berkeley has developed programs that do just that, and many Consortia have become active partners in bringing these programs into their regions. Three in particular, Family Math, Family Science, and EQUALS, have leadership institutes for trainers of teachers that exponentially expand their reach. Working with Berkeley trainers, the Consortia have been able to train hundreds of teachers, who, in turn, invite parents and children to experience science and mathematics together at accessible sites in their communities.

At first, it is not always easy to obtain parent participation. Workshop leaders and volunteers resort to any length — letters, posters, personal contacts, and food — to attract participants. But, once a parent comes to the first session, attendance is usually no longer a problem. Not only do most parents attend the remaining classes, surveys show that 80% to 95% of participants use activities at home and become more involved with their child's education.

Family Science, for example, is proving its effectiveness from rural counties in the Florida panhandle, to inner city Philadelphia to the suburbs of Seattle. It is transforming student attitudes toward science, while giving parents a sense of confidence. Hands-on problem-solving activities illustrate basic scientific concepts. Each activity is designed so that an adult and child can work on it together. Usually, once families are introduced to an activity at a Family Science class, they take the activities home to try on their own. Each activity requires only common household materials such as beans, buttons, toothpicks, pencils, and paper. Many of them may be conducted around the kitchen table.

In the Southeast alone, the SERVE Consortium has introduced more than 1,000 students and parents to the power of Family Science in just two years. Overwhelmingly, parents praised the program and its leaders with comments such as, "Wonderful!" "Great!" "Thoroughly enjoyed it!" "Learned some great new ideas. . . new twists . . . good real life connections for students and families."

It is important that all parents and community members be aware of efforts to reform mathematics and science education. The more parents understand new trends in teaching and learning, the more educators can count on their support. Family Science is one mechanism to give parents the information they need to take a more active role in their children's education, but the Consortia have used other means as well.

The District of Columbia Mathematics, Science and Technology Initiative has spearheaded a districtwide public outreach campaign in partnership with the Mid-Atlantic Consortium and the National Museum of Natural History at the Smithsonian Institution. The purpose was to highlight the need to improve mathematics and science for all students. Over 35 supporting organizations and 20 public and non-public schools hosted events during the month-long celebration. More than 40,000 flyers publicized the events and two television stations covered a number of events. Additionally, school partners hosted events showing concrete examples of what should be happening in mathematics and science classrooms when instruction is aligned with the national and local standards.



CONCLUSION

As the activities highlighted in this report show, the Consortia are knowledgeable about their states and are valued by those they serve. They are often the catalyst that brings together teachers and state-level policymakers, community members and teacher trainers, museum directors and school people, and school board members and administrators, not just in one community but across a state — and sometimes a region. Consortium staff help them find common goals and then build the means of achieving those goals. With their connections to each other, the Consortia and Clearinghouse also offer the nation's best knowledge to each state, enabling schools and communities to learn from others and take what will best serve their students.

The Eisenhower Regional Consortia and National Clearinghouse appreciate the support received from their many partners and collaborators over the years. They are eager to continue their service in the years ahead, as the nation's need for a scientifically knowledgeable populace increases and communities across the nation strive to prepare their students for responsible and productive citizenship.

You, too, can benefit from this resource. Simply call the Eisenhower National Clearinghouse or the Regional Consortium that serves your area; all are listed on page 3 of this report.

NATIONAL NETWORK OF EISENHOWER MATHEMATICS AND SCIENCE REGIONAL CONSORTIA AND NATIONAL CLEARINGHOUSE



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